



Caltrans Division of Research,  
Innovation and System Information

# Research Results

Planning/  
Policy/  
System  
Information

**MARCH 2013**

**Project Title:**

Deployment Support and Data  
Collection for Caltrans TSI Travel  
Behavior Survey Using the GPS-ATD

**Task Number:** 2251

**Completion Date:** June 30, 2012

The Global Positioning System –  
Automated Travel Diary (GPS-ATD) allows  
agencies to collect data to understand  
the factors influencing personal travel  
behavior.

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## GPS-Automated Travel Diary Enhances Travel Behavior Surveys

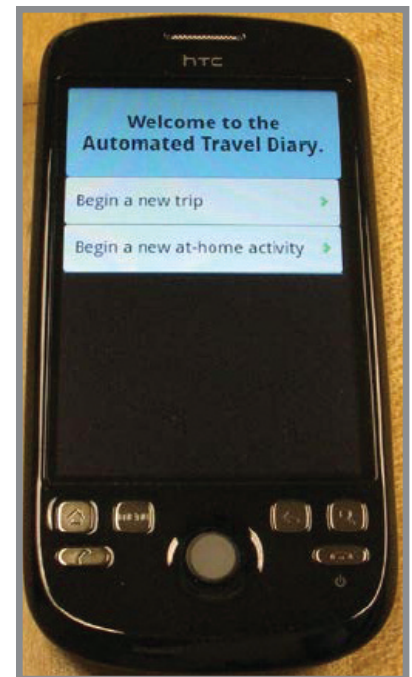
*New system allows analysts to measure the factors that influence  
personal travel behavior*

### WHAT WAS THE NEED?

Travel behavior surveys conducted by Caltrans and local state agencies have traditionally relied on participants using pen and paper diaries to collect data. Information, such as travel time, route choice, distance, and speed has generally been jotted down by individual survey participants who rely on memory and estimates. A real need existed for an automated, efficient, and affordable new comprehensive travel survey system. The ability to track short- and long-term mobility data is a critical part of developing accurate travel demand models, forecasting future demands, measuring trends in population behavior, and assessing the impact of changes in transportation policy or the transportation system.

### WHAT WAS OUR GOAL?

The project's objective was to develop and field test a new and reliable automated survey system to accurately capture day-to-day, even minute-by-minute, travel behavior, including trip purpose, travel mode, and traveler location, time, and speed. This project was intended to demonstrate the capability of smartphones to enhance travel behavior surveys.



GPS-ATD Android app



Caltrans improves mobility across  
California by performing applied  
research, developing innovations,  
and implementing solutions.



## WHAT DID WE DO?

In conjunction with Caltrans, UC Davis's Advanced Highway Maintenance & Construction Technology (AHMCT) Research Center, developed a prototype GPS Automated Travel Diary (GPS-ATD) to replace traditional pen and paper and computer-assisted approaches to travel surveys. Ten vehicular and 10 personal GPS-ATD units were produced and delivered for field testing.

With the increasing popularity of smartphones that have GPS capabilities, it was determined that developing the prototypes as originally envisioned was not as effective as using currently available technologies, so the focus shifted to developing a smartphone application (commonly called an app) instead. The GPS-ATD provides an intuitive user interface to capture trip activity information with minimum user input. The application captures and logs data from the GPS and internal sensors, minimizing user burden and errors in trip logs. During the development, the application was tested on multiple smartphone manufacturers across numerous versions of the Android operating system. About 400 trips were collected, with 80 respondents using 41 different devices with 27 unique Android models from all major U.S. wireless network carriers.

## WHAT WAS THE OUTCOME?

The GPS-ATD app was uploaded to the Google Play Store, and the source code is available for Caltrans and other public agencies. The app has been successfully tested on Android OS versions Donut through Gingerbread. Based on the test results, the AHMCT researchers are confident that the GPS-ATD app can run on any Android smartphone without modification.

## WHAT IS THE BENEFIT?

The Android app is easily modified for any survey and location-based data collection. Because of its advanced design, the app can provide many capabilities beyond previous methods in travel surveys. For example:

- Reduce the user burden by automating data collection and reducing data entry.
- Provide activity-time-space relationships.
- Minimize under-reported trips.
- Capture all transportation modes and mode changes.
- Provide strong support for automated data analysis.
- Provide vehicle position during GPS outages using inertial sensors.
- Capture second-by-second detailed vehicle position, speed, and acceleration.
- Provide wireless synchronization.

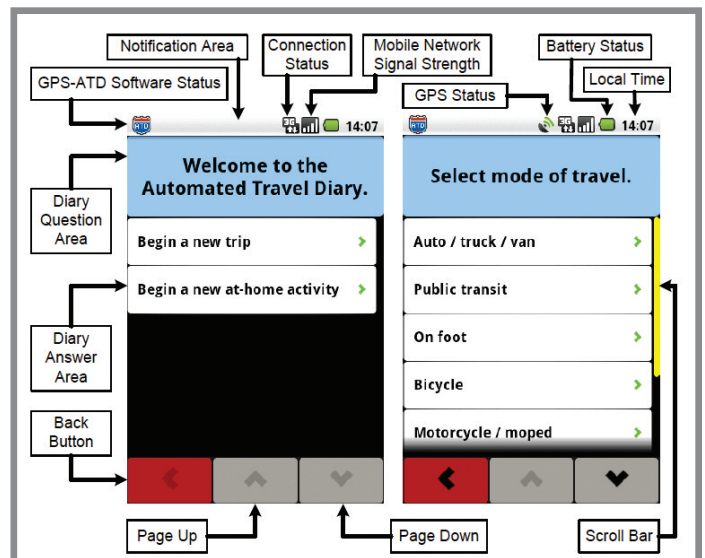
## LEARN MORE

To view the report:

<http://ahmct.ucdavis.edu/pdf/UCD-ARR-11-10-31-02.pdf>

For more information, visit the AHMCT website:

<http://ahmct.ucdavis.edu/?projects=automated-travel-diary>



Sample user interface of the  
GPS-ATD Android app